Electronics for Scientists

Wubben Science 218
TR 2:00 – 4:20 pm

Instructor	Dr. Brian Hosterman
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Office	Wubben 228C
Office Hours	MWF 10:00 – 11:50 am
	T 1:00 – 1:50 am
	R 10:00 – 10:50 am and by appointment

Prerequisite
PHYS 132 or PHYS 112.

Required Text and Supplies
The Art of Electronics, Third Edition, by Horowitz and Hill, Cambridge University Press (ISBN 9780521809269).
Learning the Art of Electronics: A Hands-On Lab Course, by Hayes and Horowitz, Cambridge University Press (ISBN 9780521177238).

Course Description
This laboratory-based course is an introduction to electric circuits and electronic instrumentation for scientists. The course will emphasize a practical approach, with students learning about electronic devices and how they work by building working circuits. Topics explored include passive circuits with resistors and capacitors, including applicatings in electric filtering; diodes transistors; op-amps;timing circuits; feedback and amplification; and digital circuits.

Course Learning Objectives
Upon completion of this course, a student should be able to:

1. Use a variety of laboratory equipment.
2. Understand and draw circuit diagrams.
3. Design, build, and troubleshoot electronic circuits.
4. Keep a well-documented laboratory journal.

Grade Distribution and Grading Scale
Your grade for this course is based on the following activities, weighted as shown.

Attendance	10%
Assignments	20%
Lab Journal	25%
Midterm Exams	25%
Final Exam	20%

All graded work will be assigned a numerical score. Your letter grade can be estimated by calculating a percentage score and referencing the table below.

≥ 90.00	A
80.00 – 89.99	B
70.00 – 79.99	C
60.00 – 69.99	D
≤ 59.99	F

All grades will be posted to D2L. Please notify the professor if you notice an incorrect grade entry.

Attendance
This is primarily a laboratory course; most of your time will be spend in the laboratory building and analyzing circuits, and thus attendance is necessary. For each class meeting that you are present, you will earn 1 point and for each that you are absent 0 points. To earn the attendance point, you must be present for the entire class period.

Reading and Homework Assignments
Please come to class prepared! It is expected that you read the material prior to attending class. Check the attached schedule for what material will be covered for any given class day. Late homework will *not* be accepted. Homework assignments will be announced in class and can also be found on the most up-to-date syllabus posted on D2L. You *must* show your work on every problem to receive full credit. In fact, it is more important that you *neatly* show your work and reasoning than obtain the correct answer. A correct answer with missing or incorrect supporting work will not be given credit. Although the assigned problems are required, I highly recommend working additional problems to practice the material.

Laboratory Journal
You must keep a laboratory journal where you will describe, in detail, your work and progress on *all* laboratory activities. The purpose of such a journal is to be detailed enough that an outsider could recreate your experiment from only your journal. Your lab journal will be collected and graded periodically. Do *not* lose your lab journal! Your laboratory journal must contain, for every day that you are in the lab:

- The date
- Description of what you aim to do
- Circuit diagrams and equipment used
- Discussions of how the circuit works
- Results from the lab exercises.
- Any other information relevant to the completion or understanding of the circuit.

Late Work
Homework and lab report drafts will be collected at the beginning of class period of the due date. Lab journals will be collected at the end of the class period on days that the journals are to be collected and graded. These graded assignments will be deducted 1 point or 10%, whichever is greater, of the total point value of the assignment if not turned in at this time, plus an additional 1 point or 10%, whichever is greater, for every 24 hours thereafter.

Exams
There will be two non-cumulative exams and a cumulative final. Exams may not be missed, although if you contact me ahead of time I will try to accommodate you in rescheduling for family emergencies or other experiences beyond your control.

Course Expectations
This course will require a fair amount of independent study (i.e. text reading and homework problems). Expect to spend a minimum of two hours outside of the classroom for every hour in the classroom.

Course Correspondence
All communication in this course will be made via your CMU email account. I will *not* respond to emails sent from non-CMU accounts. Please include the title of the course and section number in the subject line (PHYS 251). Check your email regularly throughout the semester. I will respond to your emails within 48 hours.

Plagiarism and Academic Integrity
All incidents of academic dishonesty, including, but not limited to, plagiarism and cheating, will be handled according to CMU policy. For CMU policy on academic integrity and student conduct, please refer to pages 45–46 of the 2014–2015 CMU Catalog and pages 15–16 of the Maverick Guide.

Disruptive Behavior
Please be respectful of students around you by staying quiet while the professor is lecturing. Turn off your cell phone during class. Usage of smart phones, tablets, earphones, or other devices is not acceptable during class.

Withdrawal Statement
Regular class attendance is expected. CMU is required by law to verify the enrollment of students who participate in Federal Title IV student aid programs and/or who receive educational benefits through other funding sources. CMU is responsible for identifying students who have not attended or logged into a class for which they are registered. At the conclusion of the first week of a semester, instructors will report any registered students who have "Never Attended" a class so that those reported students will be administratively withdrawn from that class. However, it is the student's responsibility to withdraw, using the appropriate CMU form, from any class which she/he is no longer attending or risk receiving a failing grade in that class. Student's wishing to withdraw must complete and submit the appropriate CMU form by the established withdrawal deadline.

Educational Access Services
In coordination with Educational Access Services, reasonable accommodations will be provided for qualified students with disabilities. Students must register with the EAS office to receive assistance. Please meet with the instructor the first week of class for information and/or contact Dana VandeBurgt, the Coordinator of Educational Access Services, directly by phone at 248-1801, or in person in Houston Hall, Suite 108.

Tutorial Learning Center
The Tutorial Learning Center is a FREE academic service for all Colorado Mesa University students. Tutors are available on a walk-in basis for many courses. Do you have a quick question? Do you need homework clarification or feedback on a paper? Are you reviewing for a test? Help

is available at the TLC! At the main campus, come to Houston Hall 113 to meet with one of our friendly peer tutors. We are open on Monday, Wednesday and Thursday from 8am-6pm; Tuesdays from 8am-7pm, and Fridays from 8am-5pm. We are also open Sundays from 1pm-6pm! Tutoring at branch campuses and distance tutoring is also available. Check out the website for schedules and locations at `http://www.coloradomesa.edu/tutoring` or call 248-1392 with any questions.

Research Assistance at the Tomlinson Library Reference Librarians can assist you if you need help with research, finding reliable print and electronic resources or citation help. The Reference Desk is on the first floor of the Tomlinson Library located on the CMU campus. And for your convenience, you can Instant Message (IM) a Reference Librarian 24/7 from the Tomlinson Library home page or call the Reference Desk at 970-248-1860. Email libref@coloradomesa.edu with your questions. Reference Desk hours: (Spring & Fall) Monday–Thursday 8 am – 9 pm; Friday 8 am –5 pm; Saturday 10 am – 5 pm; Sunday 1–9 pm. Tomlinson library also has study rooms and computer labs with color printers and scanners. Other resources for online students can be accessed at `http://www.coloradomesa.edu/cmulibrary/ecservices.html`

Student Services
The Office of Student Services works to support CMU students in all aspects of college life, by offering a vast array of services, resources and programs that make each student's time at CMU as exciting and successful as possible. Student Services works collaboratively with faculty, students, and staff to create a campus community that fosters the growth of students as strong individuals and productive citizens. To learn more, go to `http://www.coloradomesa.edu/studentservices`.

Student Success
A guide to student success at CMU can be found at `http://www.coloradomesa.edu/academics/documents/StudentSuccessatCMU_WCCC.pdf`.

Disclaimer
The professor reserves the right to change any aspect of this syllabus at any time as fairness and circumstances dicate. An updated syllabus can always be found via D2L.

Tentative Course Schedule

The weekly coverage might change as it depends on the progress of the class. However, you must keep up with the daily reading and problem assignments. The reading and homework problems need to be completed for the class day they are listed! An updated calendar can be located on D2L. Homework exercises are interspersed throughout the chapters of *The Art of Electronics*. Most labs will be from *Learning the Art of Electronics*. Other lab exercises may be handed out during class.

Tuesday	Thursday
Aug 22nd **1** Voltage, current, resistance Labs: Resistor, Lightbulb, 1L.4	24th **2** Voltage dividers Read §1.1–1.2.5 HW: 1.1, 1.2, 1.5, 1.6 Labs: 1L.2, 1L.3
29th **3** Thévenin equivalent circuit Read §1.2.6–1.3.5 Labs: 1L.6	31st **4** Capacitors Read §1.4.1, 1.4.2 HW: 1.9, 1.10, 1.11 Labs: 2L.1
Sep 5th **5** RC Differentiators and Integrators Read §1.4.3–1.4.5 Labs: 2L.1	7th **6** RC highpass and lowpass filters Read §1.7–1.7.1, 1.7.12 HW: 1.17, 1.18, RC handout Labs: 2L.2 (omit 2L.2.4)
12th **7** Diodes Read §1.6.1, 1.6.2 Labs: 3L.2	14th **8** Diode circuits Read §1.6.6 HW: 1.33, highpass handout Labs: 3L.5
19th **9** Diode circuits Labs: Limiter	21st **10** Diode circuits HW: 1.22, Diode handout Labs: Scope Probe
26th **11** **Exam 1** (Chapter 1)	28th **12** Bipolar transistors Read §2.1–2.2.3 Labs: 4L.1
Oct 3rd **13** Bipolar transistors Read §2.2.3–2.2.8 Labs: 4L.2	5th **14** Bipolar transistors HW: 2.1, 2.4, 2.5 Labs: 4L.3
10th **15** Bipolar transistors Labs: 4L.4	12th **16** Operational amplifiers Read §4.1–4.3.1 HW: Transistors handout Labs: 6L.1, 6L.2, 6L.3

Tuesday		Thursday	
17th Op amps Read §4.1–4.3.1 Labs: 6L.4, 6L.5	**17**	19th Op amps Read §4.1–4.3.1 HW: 4.1, derive diff. amp gain Labs: 6L.6	**18**
24th Op amps Read §4.1–4.3.1 Labs: 6L.8	**19**	26th Oscillators Read §7.1.1, 7.1.2, 7.1.3 HW: Op amp handout Labs: 8L.1	**20**
31st Oscillators Labs: 8L.2	**21**	Nov 2nd Oscillators HW: Comparators and oscillators handout Labs: 8L.5	**22**
7th Oscillators Labs: Sawtooth Oscillator	**23**	9th **Exam 2** (Chapters 2, 4, 7)	**24**
14th Digital logic Read §10.1, 10.2.3, 10.2.4 Labs: 14L.1, 14L.2	**25**	16th Digital logic HW: 10.1, 10.7, 10.8, 10.9 Labs: 14L.4	**26**
21st Thanksgiving Holiday No Class		23rd Thanksgiving Holiday No Class	
28th Digital logic Read §10.3, 10.4.1-10.4.3 Labs: 15L.1, 15L.2	**27**	30th Digital logic Labs: 15L.3	**28**
Dec 5th Digital logic Labs: 15L.5	**29**	7th Digital logic Labs: JK Flip Flop	**30**
12th **Final Exam** 1:00 – 2:50 pm		14th	